Green Auto Market
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Automakers see a nexus between electric and autonomous vehicle technologies

General Motors Co. is betting big on its future in the fast-changing automotive space. Along with its investments in Lyft, Sidecar, and its Maven startup brand, GM has announced management changes to support its next-generation vehicle technologies. Doug Parks, GM's vice president for global product programs, is now vice president for autonomous technology and vehicle execution. Parks will oversee projects to develop new electrical and battery systems and software for autonomous and electric vehicles, the company said. There are other executives taking positions in GM's new Autonomous and Technology Vehicle Development Team with similar backgrounds in electric vehicles and technology innovations.

There are other OEM executives who see a logical integration of electric and autonomous vehicle technologies. "The two most profound innovations in automotive since the moving production line are electrification and autonomy," Tesla CEO Elon Musk said to *Automotive News*.

Tim Lipman PhD, Co-Director at the Transportation Sustainability Research Center, UC Berkeley, sees a "nexus" between autonomous and electric vehicles. Lipman spoke on a panel that I moderated last fall that was part of the Northern California Clean Technology Forum hosted by the Sacramento and East Bay Clean Cities Coalitions.

Autonomous vehicles are ideal for charging the electric vehicles most efficiently, such as during off-peak hours, Lipman said. Electric vehicles are easier to control and maintain than traditional internal combustion engine vehicles. Electric autonomous vehicles would be ideal for meeting energy efficiency and environmental targets in a fleet, he said. It's all part of a larger trend that UC Berkeley's Transportation Sustainability Research Center is tracking as cities continue to grow in population; increasing traffic congestion and air pollution are driving policy changes with increased use of transportation alternatives such as carsharing, ridesharing, electric vehicles, and autonomous vehicle technologies, he said.

Nissan would agree on the nexus and integration of EV and self-driving technologies, as you can see in the photo above from the automaker's 2014 Autonomous Drive Car test program.

Here's a look at the latest developments in OEM strategic planning on the integration of electrified and autonomous vehicle technologies…….

- **Along with Doug Parks, GM is appointing** to its new Autonomous and Technology Vehicle Development Team: Pam Fletcher, executive chief engineer of global electric vehicles, and Andrew Farah, chief engineer of global electrified vehicles. Scott Miller, current director of global C02 strategy, and Sheri Hickok, current chief engineer of GM's Next-Generation Light Duty Pickup, will also join the team. Hickok will become executive chief engineer for "autonomous joint ventures and fleet execution," GM said.
- **GM is investing $500 million** in ridesharing company Lyft and has acquired the assets of Sidecar, the third largest ridesharing company in the U.S. after Uber and Lyft. GM President Dan Ammann last month said GM would partner with Lyft to create a network of autonomous cars for hire and a set of ridesharing services. In late January, GM also announced the launch of Maven, a carsharing service allowing users to access a Chevrolet vehicle on the new Maven mobile app for as little as $6 per hour, similar to what Zipcar offers. In the driverless car space, GM will it launch its "Super Cruise" semi-autonomous driving technology for Cadillac next year.
- **While Apple won't comment on its strategic plans** for autonomous and electric vehicles, its hiring practices indicate something is in the works. Jamie Carlson, former "Autopilot Firmware Manager" at Tesla Motors, joined Apple in August to work on a special projects team at the company. Along with Carlson, new-hire colleagues at Apple include Megan McClain, a former Volkswagen engineer with expertise in automated driving; graduate researcher Vinay Palkkode who came from Carnegie Mellon; and Paul Furgale, the former deputy director of the Autonomous Systems Lab at the Swiss Federal Institute of Technology. Apple seems to be considering making in an investment in an autonomous vehicle testing ground at the GoMentum Station in Concord, Calif. Earlier in 2015, news leaked out about Project Titan, the possible code name for Apple's electric vehicle program. Apple has likely set up a lab to test out a vehicle that looks like a minivan. Several hundred employees were working on the project.
- **Google hasn't commented** on how its self-driving car research and development could tie into future EVs. Google has been putting a lot of test miles on its fleet of autonomous electric cars in use on the roads around the company's Mountain View, Calif., headquarters.
- **As part of Tesla's new Version 7.0** software package in the Model S, Autopilot was transmitted to cars in the U.S. in October, which was then followed by Europe and Asia. Tesla's new Model X sport utility vehicle also offers Version 7.0 and Autopilot. Customers must pay a one-time fee of $2,500 to activate the self-driving software when they buy a car, or $3,000 to activate the feature after delivery. The software update uses cameras, radar, ultrasonic sensors, and data to steer down the highway, change lanes, and adjust speed in response to traffic. The driver can follow a lane on the highway and change lanes using the turn signal. The 7.0 software and Autopilot can deliver parallel parking that detects an open parking space and takes control if the driver asks for the car to park itself.
- **Tesla has been investing in high-resolution maps** that Tesla has built in-house by tracking where its cars have driven. If cars appear to be switching out of Autopilot mode at a particular spot on the road, Musk said, Tesla will update its maps and its software. "The big differentiator here is that the whole Tesla fleet operates as a network, so when one car learns something, the whole fleet learns it," Musk said. It is a "powerful network effect," he said, adding that "any car company that doesn't do this will not be able to have a good autonomous driving system."

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Fuel (in US)	Current Price*	One Month Ago	One Year Ago
Regular gasoline	$1.799	$2.000	$2.054
Diesel	$2.050	$2.260	$2.804
E85	$1.585	$1.810	$1.721
E85 – adjusted**	$2.086	$2.382	$2.264

*As of 1/31/16
**E85 MPG/BTU adjusted price.
Price data for gasoline, diesel, E85, and E85 – adjusted taken from AAA Daily Fuel Gauge Report.

Most Expensive State Fuel Prices – Gasoline and Diesel

10 Most Expensive – Regular Gasoline
(as of 1/31/16)

Hawaii	$2.637
California	$2.582
Alaska	$2.429
Nevada	$2.273
Washington	$2.163
New York	$2.065
District of Columbia	$2.042
Oregon	$2.023
Idaho	$1.992
Pennsylvania	$1.990

10 Most Expensive – Diesel
(as of 1/31/16)

Hawaii	$4.337
California	$2.446
New York	$2.424
District of Columbia	$2.410
Connecticut	$2.404
Pennsylvania	$2.340
Nevada	$2.320
Washington	$2.290
Maine	$2.282
Vermont	$2.282

Cost of Crude Oil per Barrel	Current Price	One Year Ago	Five Years Ago
(as of 1/25/16)			
WTI	$30.31	$47.79	$90.99
Brent	$29.82	$47.52	$98.97

Oil price data comes from US Energy Information Administration.